FIG. 2 is a detailed block diagram of the third from the top block of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In order to provide for an efficient packet service, changes to the existing standard are required. Several new channel types are defined herein to distinguish from existing channels such as the paging and access channels; a forward and reverse packet data channel, forward packet data control channel and associated forward power control and channel status subchannels. The composition and structure of these channels is functionally described in the following sections.

Reverse Packet Data Channels

A reverse packet data channel is associated with a single receiving element at the cell site. This receiver element is shared by a given set of mobiles within the cell all having a common attribute: reverse link data rate. Several such receivers may exist within a cell, each serving a potentially different group of users. The reverse link data rate determination is made by the mobile based on it's power class and estimated transmit power margin. For example, a mobile may determine based on the open loop power estimate that a 20 dB transmit power margin exists over what is required to operate reliably at the lowest data rate supported. In this case, the mobile may select the reverse packet data channel corresponding to the maximum data rate which the link can support.

The reverse packet data channels are delineated by assigning a given code or set of codes to correspond to a fixed data rate. Mobiles that select a specific data rate are required to use a code from the set which is assigned to that channel. For example, suppose that 8 different data rates are supported in the packet data network. A packet data channel code set is assigned to each of the 8 channels and a corresponding receiver element is assigned to serve a specific channel or channel set. When only one code is assigned to support a given data rate channel, the possibility of two or more users attempting to simultaneously use the reverse packet data channel exists. When multiple codes are assigned, this likelihood is reduced at the expense of increased processing requirements. The number of data rates supported is a system configurable parameter as are the actual data rates.

Contention resolution on the reverse link packet data channel is handled in a number of ways. At the physical layer, the channel status feedback is used to indicate acquisition success/failure. In the event of a collision, the random access protocol used at the physical layer invokes a randomized backoff and retry algorithm. When multiple codes are used per reverse packet data channel, the radio link protocol (RLP) employed can be used to indicate the acquired code channel in a forward packet data channel message.

Slotting is used on the reverse link packet data channels with configurable slot durations permitted. The minimum permitted slot duration will be a function of the data rate on the forward packet data channel. In order to distribute system load and receiver processing more evenly, staggered slotting may be implemented. In this case, reverse packet data channels corresponding to different data rates are assigned distinct slot time offsets relative to system time. In this manner, packets from the various data rate groups do not arrive at the cell simultaneously, thereby increasing the cell load instantly. In addition, the staggering of slot times allows a single receiver element to support multiple data rate channels is desired. The slot timing offset employed and slot duration are system configurable parameters.

Continuous transmission is employed over the duration of a packet as described in R. Walton, "Use of Repeat Coding for PCS CDMA Reverse Link Traffic Channel Operation", JTC(AIR)/94.04.28–297, March 1994, herein incorporated by reference. Data rate may be changed during the packet only if commanded by the base station. Variable packet durations are supported and are expressed in units of frames (i.e. multiples of 20 msec intervals). Interleaving and coding shall follow the recommendations set forth in R. Walton, "Proposed Repeat Coding Mode Functionality for PCS CDMA Reverse Link Traffic Channel Operation", JTC(AIR)/94.06.13–415, June 1994, herein incorporated by reference. Extension to rates in excess of 14.4 kbps is possible using the extended CDMA PCS system modulation parameters for the reverse traffic channel defined in Qualcomm, Inc. and Motorola, Inc. "The CDMA PCS System Common Air Interface Proposal". JTC(AIR)/93.11.01–404, Nov. 1, 1993, and Qualcomm, Inc. "Proposed CDMA PCS Standard", JTC(AIR)/94.01.19–22R1, Apr. 28, 1994, both herein incorporated by reference. The maximum packet duration shall be a system configuration parameter. This duration may be related to the window size employed in the RLP that is used to perform the ARQ functions.

By using dedicated channel codes assigned to specific data rates, the reverse packet data channel receivers to not have to estimate the channel data rate. This greatly simplifies the processing requirements of the receiver. Since the cell site knows both the slot timing and data rate of arriving packets on a given reverse packet data channel, the number of hypotheses that require examination in a given interval can be made to match the processing capabilities of the cell site hardware. In addition, the imposed channel structure facilitates rapid detection of packets and enables closed loop power control to be established quickly. Since the detection threshold is fixed for a given data rate, the closed loop power control can be enabled as soon as the detection threshold is exceeded. This allows short preambles to be employed, thereby increasing the reverse packet data channel efficiency. Further, the status of the acquisition can be conveyed to the mobile quickly, allowing mobiles to exit the channel rapidly if acquisition fails.

Forward Packet Data Channels

On the forward link, forward packet data channels are used to carry outbound traffic. Associated with each forward packet data channel are one or more reverse packet data channels. In general, the forward packet data channel operates at a fixed data rate, although this is not necessarily a restriction. (It is possible to employ multiple data rates on a single forward packet data channel. In this case, it is necessary to establish a subchannel to carry system information at a known data rate. The slot timing of this subchannel is fixed to allow mobiles receiving at other rates to change rates at the appropriate time to listen for system messages. Power allocation can be applied judiciously to packets based on transmitted data rate. The RLP employed will likely be ACK/NAK-based in this case, since it is difficult for the mobile to discriminate valid message decode failures.) The basic concept here is to provide for the possibility of multiple reverse packet data channels per forward packet data channel with the added flexibility that the reverse packet data channels may serve different user groups having distinct data rate requirements.